Appendix A

Species Listing PROPOSAL Form:

Listing Endangered, Threatened, and Special Concern Species in Massachusetts

Scientific name: *Hemidactylium scutatum* Current Listed Status (if any): Species of Special Concern

Common name: Four-toed salamander

Proposed Action:

_____Add the species, with the status of: _____
__X__Remove the species
_____Change the species' status to: _____
_____Change the scientific name to: _____
_____Change the common name to: _____
(Please justify proposed name change.)

Proponent's Name and Address:

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Association, Institution or Business represented by proponent:
Natural Heritage & Endangered Species Program, MA Division of Fisheries and Wildlife

Proponents' Signatures:

Date Submitted: 1/25/2008
Revised: 4/7/2008

Please submit to: Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, 1 Rabbit Hill Road, Westborough, MA 01581

Justification

Justify the proposed change in legal status of the species by addressing each of the criteria below, as listed in the Massachusetts Endangered Species Act (MGL c. 131A) and its implementing regulations (321 CMR 10.00), and provide literature citations or other documentation wherever possible. Expand onto additional pages as needed but make sure you address all of the questions below. The burden of proof is on the proponent for a listing, delisting, or status change.

(1) Taxonomic status. Is the species a valid taxonomic entity? Please cite scientific literature.

Yes. The Four-toed Salamander, *Hemidactylium scutatum*, is a distinct species with no described subspecies (Temminck and Schlegel in Von Siebold 1838)

(2) Recentness of records. How recently has the species been conclusively documented within Massachusetts?

The Four-toed Salamander has been documented at multiple sites in Massachusetts as recently as 2007. The Four-toed Salamander was included in the Massachusetts Division of Fisheries and Wildlife's (DFW's) publication, Nongame Wildlife for Special Consideration in Massachusetts, (Cardoza and Blodget 1983) which

was the Commonwealth's first officially published list of rare wildlife species. Since the Four-toed Salamander was first listed as a "Species of Special Concern" in 1983, there has been a substantial increase in the number of Four-toed Salamander records received by NHESP on an annual basis (Figure 1) in part due to increased knowledge of survey methods and intensified survey effort.

(3) Native species status. Is the species indigenous to Massachusetts?

Yes. The Four-toed Salamander is native to Massachusetts and other New England States (CT, ME, NH, NY, RI, VT) (Petranka 1998).

(4) Habitat in Massachusetts. Is a population of the species supported by habitat within the state of Massachusetts?

Yes. The Four-toed Salamander breeds in wetlands with hummocks of wet moss, grass and/or sedges typically adjacent to slow moving, sluggish streams or pools of standing water such as vernal pools or other perennial ponding areas (*i.e.*, bogs, beaver ponds, red maple and Atlantic white cedar swamps, or groundwater seeps) that generally lack fish but persist with a hydroperiod of saturation during August or September in most years (Hunter et al. 1992; Petranka 1998; Richmond 1999; DeGraff & Yamasaki 2001; Chalmers 2004). Wetlands characteristically include S*phagnum* moss, a woody debris substrate, and often connectivity to small streams or seeps. Nest site characteristics include the presence of mossy hummocks (typically *Sphagnum* spp.), steeper shorelines, and deeper shoreline vegetation for nesting (Chalmers 2004). Outside of the nesting season, adults and juveniles feed, shelter, and over-winter within forested uplands and wetlands in the general vicinity of nesting sites. As discussed below, suitable habitat appears to be quite widespread in Massachusetts and, in recent years, there has been increased documentation that this cryptic species occurs throughout much of the state (Figure 2).

(5) Federal Endangered Species Act status. Is the species listed under the federal Endangered Species Act? If so, what is its federal status (Endangered or Threatened)?

No.

(6) Rarity and geographic distribution.

(a) Does the species have a small number of occurrences (local populations) and/or small size of populations in the state? Are there potentially undocumented occurrences in the state, and if so, is it possible to estimate the potential number of undocumented occurrences?

(b) What is the extent of the species' entire geographic range, and where within this range are Massachusetts populations (center or edge of range, or peripherally isolated)? Is the species a state or regional endemic?

The Four-toed Salamander's geographic range extends from Nova Scotia southward to the Gulf of Mexico and westward to Oklahoma, Missouri, and Wisconsin; populations are discontinuous in many areas of the south and southwest portions of its range (Petranka 1998). This species is not a state or regional endemic, and the Four-toed Salamander is ranked as "G5" and "N5" by Nature Serve, indicating that the species is globally and nationally "secure" (http://www.natureserve.org/explorer/). This species is listed in Maine and Vermont, and is not listed in other nearby states (CT, RI, NH, NY, NJ, and PA). Recent research has indicated that this species is more abundant in Maine than was previously thought (Chalmers 2004; Chalmers & Loftin 2006).

In Massachusetts, the Four-toed Salamander has been documented in 148 towns. It is well distributed throughout the Eastern and Central portions of the state, with a scarcity of records from Berkshire County (Figure 2). It is unknown whether a lack of search effort explains the lack of records in Berkshire County, or whether other factors such as differences in wetland characteristics might explain the observed distribution pattern.

The Four-toed Salamander is a fairly cryptic species that is difficult to detect outside of the egg-laying or nesting season (late April – May). Even during the nesting season, specialized survey techniques are required to locate

nests. During the past two decades, increasing numbers of amateur and professional herpetologists have learned how to survey effectively for this species in Massachusetts, resulting in a substantial increase in the number of records reported to the NHESP on an annual basis (Figure 1), and an increased number of distinct "Element Occurrences" in the NHESP database (currently 240; Figure 3). An element occurrence is a geographically distinct record, documented in the NHESP database. A given element occurrence may represent a single or multiple observations of the Four-toed Salamander at a given locus. As we lack population size data for the vast majority of element occurrences, the number of extant element occurrences should be thought of as representing the number of locales in Massachusetts where Four-toed Salamanders have been documented to be present within the past 25 years.

Suitable nesting habitat for this species is widespread to abundant throughout much of the state, and suitable habitat surveyed during the appropriate time of year is frequently occupied (Regosin and French, personal observation). Therefore, the potential for undocumented occurrences in the state is high. However, as stated above, there are fewer records for this species in western Massachusetts, and there is some indication that apparently suitable habitat in this part of the state may be unoccupied with some regularity (Richmond, personal communication, received 2/29/08). Evidence for a large number of undocumented occurrences is provided by a review of drift fence and pitfall trap studies conducted in Massachusetts since August 2005. Between March 2004 and October 2007, there have been 19 drift fence studies for which Scientific Collecting Permits have been issued to capture *Ambystoma* salamanders, distributed west to Holyoke, and east to Georgetown. At 9 of 19 sites (47%) Four-toed Salamanders were captured incidentally, even though this species was not previously documented at these sites.

Adult and juvenile Four-toed Salamanders occupy forested habitat in the vicinity of suitable nesting areas. Although relatively little is known about terrestrial habitat use, the species appears to occupy both upland and wetland forest, and there is some evidence that terrestrial densities may decline as distance to nearest nesting habitat increases (Windmiller et al., unpublished data). Four-toed salamanders have been documented in upland forest greater than 250 m from the wetland edge, although at the one site where terrestrial habitat use has been partially quantified, a large majority of the documented population remained considerably closer to the edge of the breeding wetland (Windmiller et al., unpublished data)

Larger breeding populations (*i.e.*, > 25 nests at a single geographic locus) are poorly documented in the state. There are, however, two drift fence and pitfall trap studies documenting the largest known populations of the Four-toed Salamander. A 2001 study in Easton/Taunton resulted in the capture of 140 individuals, and a 2003 study in Northborough resulted in 486 adult captures and the documentation of 107 nests. Chalmers (2004) documented that the number of nesting females per wetland in Maine is typically small (e.g. < 10/wetland) and anecdotal observations suggest that this pattern likely applies to Massachusetts as well. This is a conservation concern, as it suggests a meta-population structure where dispersal and colonization of breeding wetlands is vital. As a result, this species is likely vulnerable to forest fragmentation and habitat loss (see Section 8). However, field surveys conducted by the authors and others in central and eastern Massachusetts indicate that suitable habitat tends to be widespread across many landscapes, is often occupied, and often remains well-connected to other occupied nesting habitats. For example, during spring 2007, Regosin (unpublished data), documented six distinct Four-toed salamander nesting areas within a +/-330 Ha forest tract in Stoughton, MA during two brief (<2 hr each) site visits. As <15 Ha of this large tract were surveyed, it is likely that this species is considerably more widely distributed at this site. Similarly, Regosin (unpublished data) partially surveyed a +/-60 Ha section of a large forest block in Sudbury, MA during two site visits in 2005 and 2006, and identified three distinct Four-toed Salamander nesting areas.

(7) <u>Trends</u>.

(c) Is the species decreasing (or increasing) in state distribution, number of occurrences, and/or population size? What is the reproductive status of populations? Is reproductive capacity naturally low? Has any long-term trend in these factors been documented?

There are no trend data for this species in Massachusetts. In our opinion, this species abundance is likely to have increased during the 19th and early 20th centuries, as farm land reverted to forest throughout much of the state.

Appendix A

Since the mid-20th century, increasing road traffic, road density, and forest loss are likely to be leading to the undocumented decline of this species at specific locales. Nonetheless, the species is documented to persist in many suburbanizing landscapes. Females generally lay 20-60 eggs (Petranka 1998), and there is no reason to expect reproductive capacity or juvenile survivorship to be low relative to other Plethodontid salamanders. Although development-related threats to this species have been increasing, it is our opinion that, given the documented and predicted abundance of this species, number of populations occurring on protected land, and our assessment of the severity of threats (see below), this species does not "…occur in such small numbers of with such a restricted distribution or specialized habitat requirements that it could easily become threatened within the commonwealth" (M.G.L. c. 131A). Therefore, the species should be de-listed at this time.

(8) Threats and vulnerability.

(d) What factors are driving a decreasing trend, or threatening reproductive status in the state? Please identify and describe any of the following threats, if present: habitat loss or degradation; predators, parasites, or competitors; species-targeted taking of individual organisms or disruption of breeding activity.
(e) Does the species have highly specialized habitat, resource needs, or other ecological requirements? Is dispersal ability poor?

As stated above, the Four-toed Salamander is vulnerable to forest loss and fragmentation, and increases in road traffic and road density. The species utilizes specialized nesting habitat (e.g. *Sphagnum* hummocks with appropriate hydrology), but this habitat is fairly abundant in the Commonwealth. As the number of females documented to nest in a given locale often appears to be small, continued ability to disperse across the landscape may be important to the conservation of this species. Although forest loss and habitat fragmentation is a potential threat, the Four-toed Salamander is a vagile species that has been documented hundreds of feet from the nearest breeding habitat.

Of the 240 occurrences in the NHESP database, 161 (67%) have been ranked "A" or "B" by NHESP biologists, generally indicating relatively intact, unfragmented landscapes (Figure 4); at least 43% of these occurrences are partially found within protected lands. In addition, approximately 34% of current observations (169 of 504; note that some of the 240 "occurrences" are comprised of multiple separate observations) occur on permanently protected land. Four-toed Salamanders have been documented to occur on 66 separate blocks of protected land, including 26 open space blocks >100 acres in size and 15 open space blocks >500 acres in size (Figure 5).

(9) Conservation goals.

What specific conservation goals should be met in order to change the conservation status or to remove the species from the state list? Please address goals for any or all of the following:
(a) State distribution, number of occurrences (local populations), population levels, and/or reproductive rates
(b) Amount of protected habitat and/or number of protected occurrences
(c) Management of protected habitat and/or occurrences

Pursuant to the MESA regulations, "The Director shall list as a species of Special Concern any species of plant or animal which has been documented by biological research and inventory to have suffered a decline that could threaten the species if allowed to continue unchecked or that occurs in such small numbers or with such a restricted distribution or specialized habitat requirements that it could easily become threatened within Massachusetts" (321 CMR 10.03(6)).

In this proposal, we demonstrate that the Four-toed Salamander is widely distributed throughout eastern and central Massachusetts (west to Berkshire County, Figure 2). Within this geographic area, the species is apparently widespread, documented by 240 distinct extant element occurrences, with increasing numbers of occurrences being reported to the NHESP in recent years (Figures 1 & 3). Suitable nesting habitat is common throughout much of this range. There are many occurrences on protected land, including 15 occurrences associated with open space parcels >500 acres in size and 41 occurrences associated with open space parcels >100 acres in size (Figure 5). Certain life history characteristics of this species (e.g. relatively small local breeding sub-populations) may make this species vulnerable to forest loss and fragmentation

Appendix A

(Section 8). However, the lack of rarity and widespread geographic range indicate that this species is does not occur "in such small numbers or with such a restricted distribution or specialized habitat requirements that it could easily become threatened within Massachusetts" (321 CMR 10.03). The Four-toed Salamander should continue to be monitored for changes in abundance and distribution. Should evidence of a significant decline be detected, this species should be reconsidered for listing.

Literature cited additional documentation, and comments.

Cardoza, J.E. and B.G. Blodget. 1983. Nongame Wildlife for Special Consideration. Fauna of Massachusetts Series No. 5.

Chalmers, R. and C. Loftin. 2006. Wetland and microhabitat use by nesting four-toed salamanders in Maine. *Journal of Herpetology* 40: 478-485.

Chalmers, R. 2004. Wetland and nest scale habitat use by the four toed salamander in Maine and a comparison of survey methods. Master's Thesis, University of Maine.

DeGraff, R. and M. Yamasaki. 2001. *New England Wildlife: Habitat, Natural history, and Distribution*. University Press of New England, Hanover, NH.

Hunter, M. *et al*. 1992. The amphibians and reptiles of Maine. *Maine Agricultural Experiment Station Bulletin* 838.

Klemens, M.W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. *State Geological and Natural History Survey of Connecticut*, Bulletin 112.

Nature Serve Explorer. Accessed: May 18, 2006. (http://www.natureserve.org/explorer/)

Petranka, J.W. 1998. *Salamanders of the United States and Canada*. Smithsonian Institution Press, Washington, DC.

Regosin, J. and T. French. Personal observations.

Regosin, J. (Unpublished data).

Richmond, A. (Personal communication, received February 29, 2008).

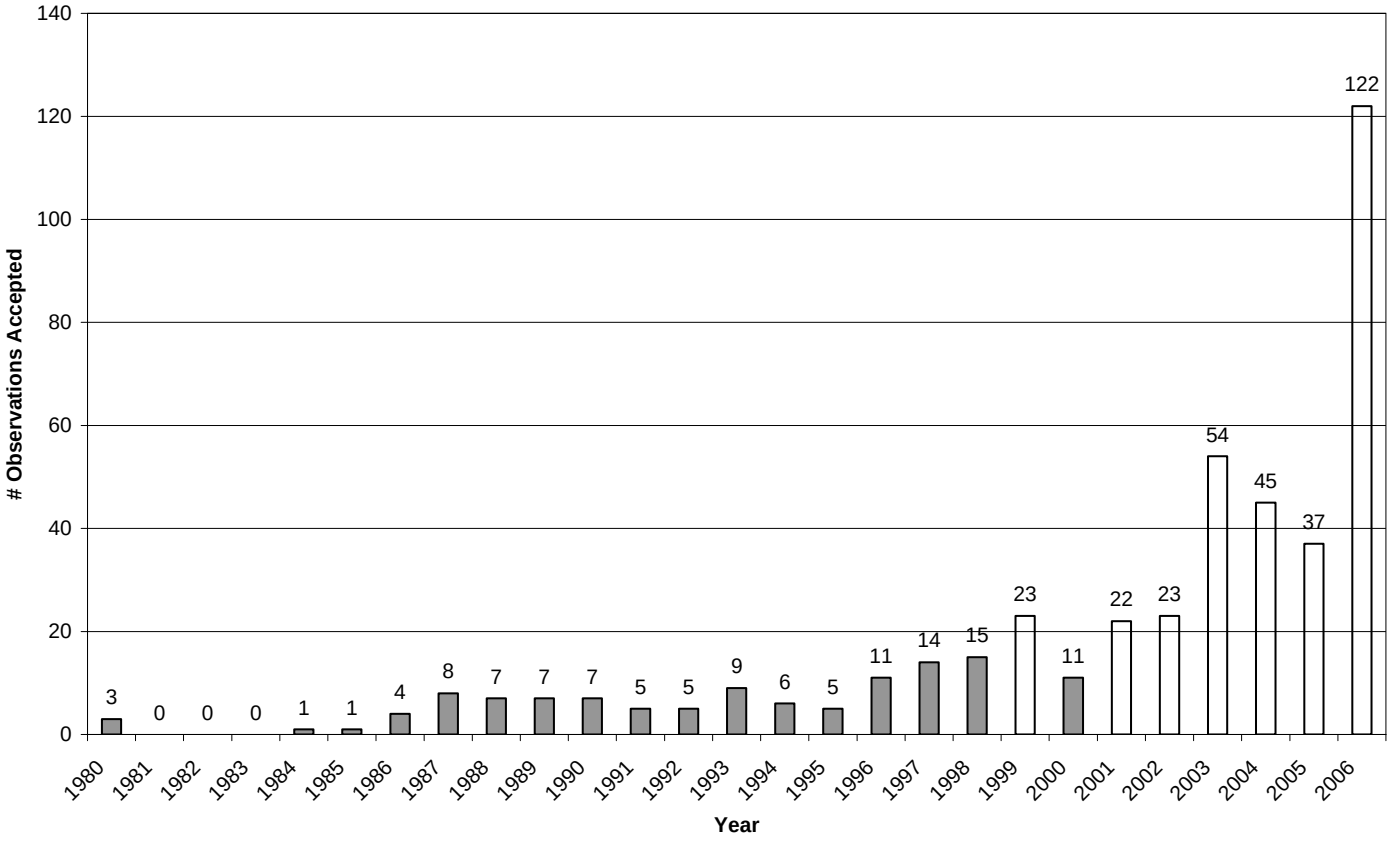
Richmond, A. 1999. Contributions to the Biology of the Four-toed Salamander, Hemidactylium scutatum (Schlegel, 1838), in New England. In unpublished Dissertation.

Temminck, C.J., and H. Schlegel. 1835. Vol. III Reptilia. xxii + 144 p., 27 pls. In: P.F. Von Siebold, Fauna Japonica sive Descriptio animalium, quae in itinere per Japonianum, jussu et auspiciis superiorum, qui summum in India Batava Imperium tenent, suscepto, annis 1823-1830 colleget, notis J.G. Lalau, Leiden [1838]. [Though the title page bears the date 1838, Volume III was issued in several parts, each with consecutively numbered pages and separately numbered plates. According to Stejneger 1907, Herpet. Japan. Bull. U.S. Natl. Mus. Washing.

Windmiller, B.S., *et al.* (Unpublished data).

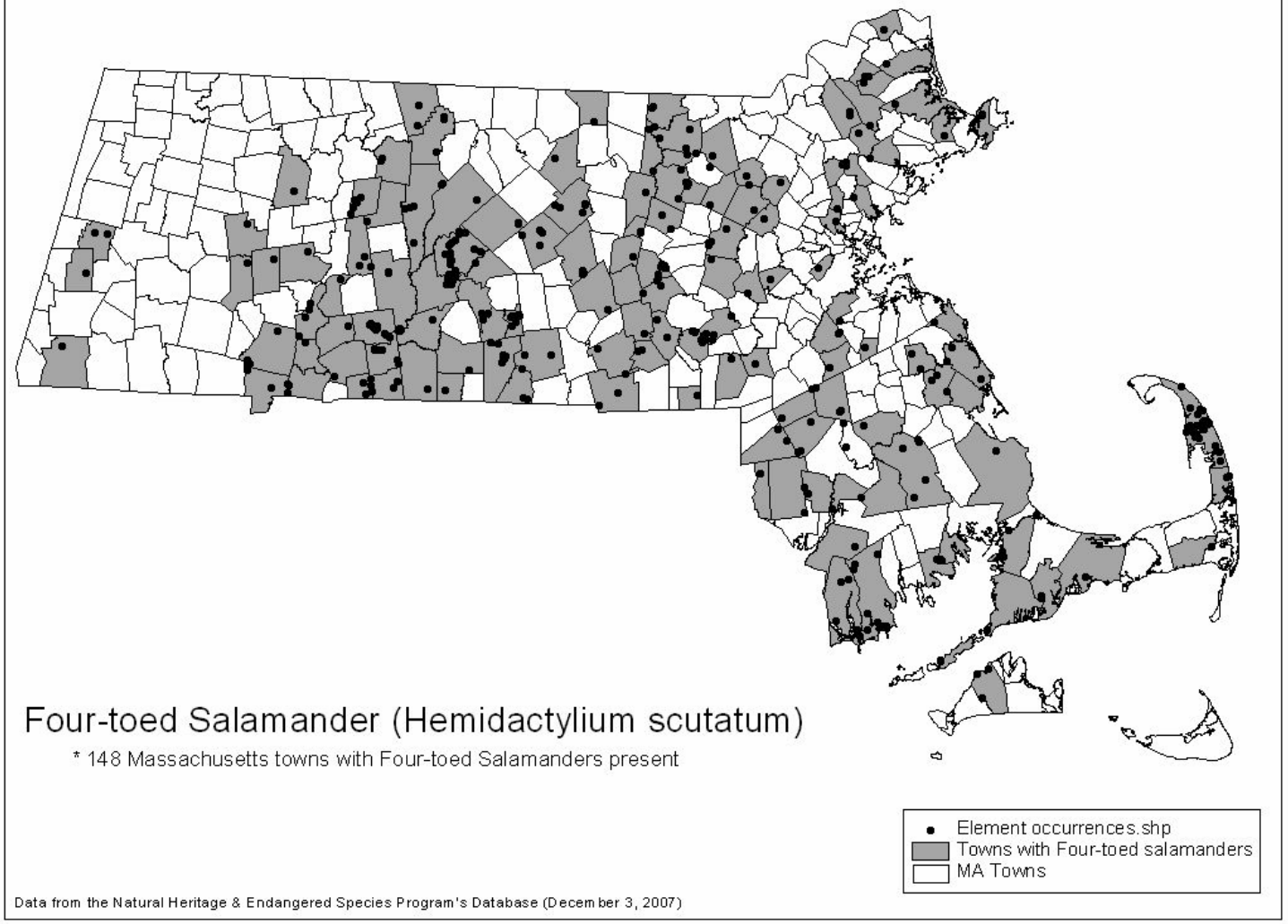
Appendix A

Figure 1. *Hemidactylium scutatum* observations accepted in the NHESP database by year.



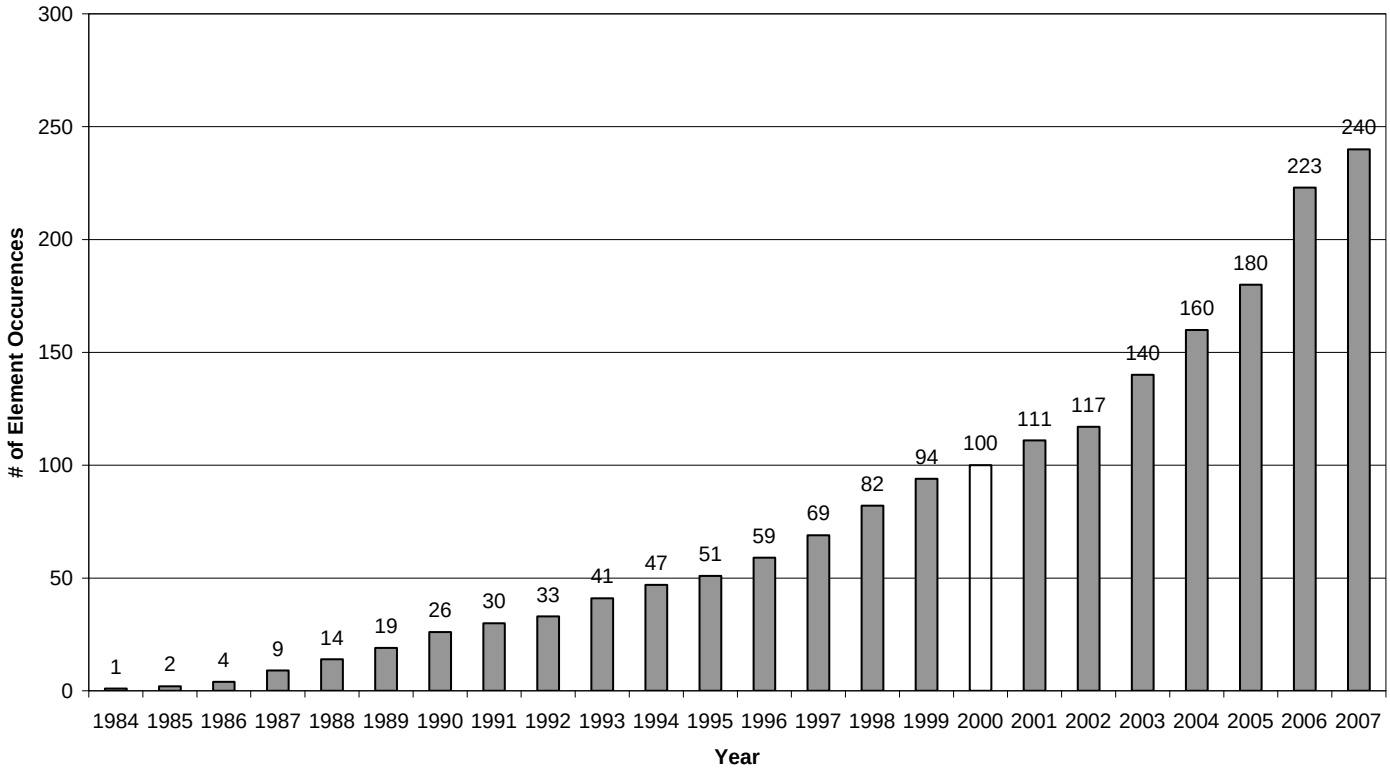
Appendix A

Figure 2. Hemidactylium scutatum in Massachusetts. Shaded towns have been documented with the Four-toed Salamander.



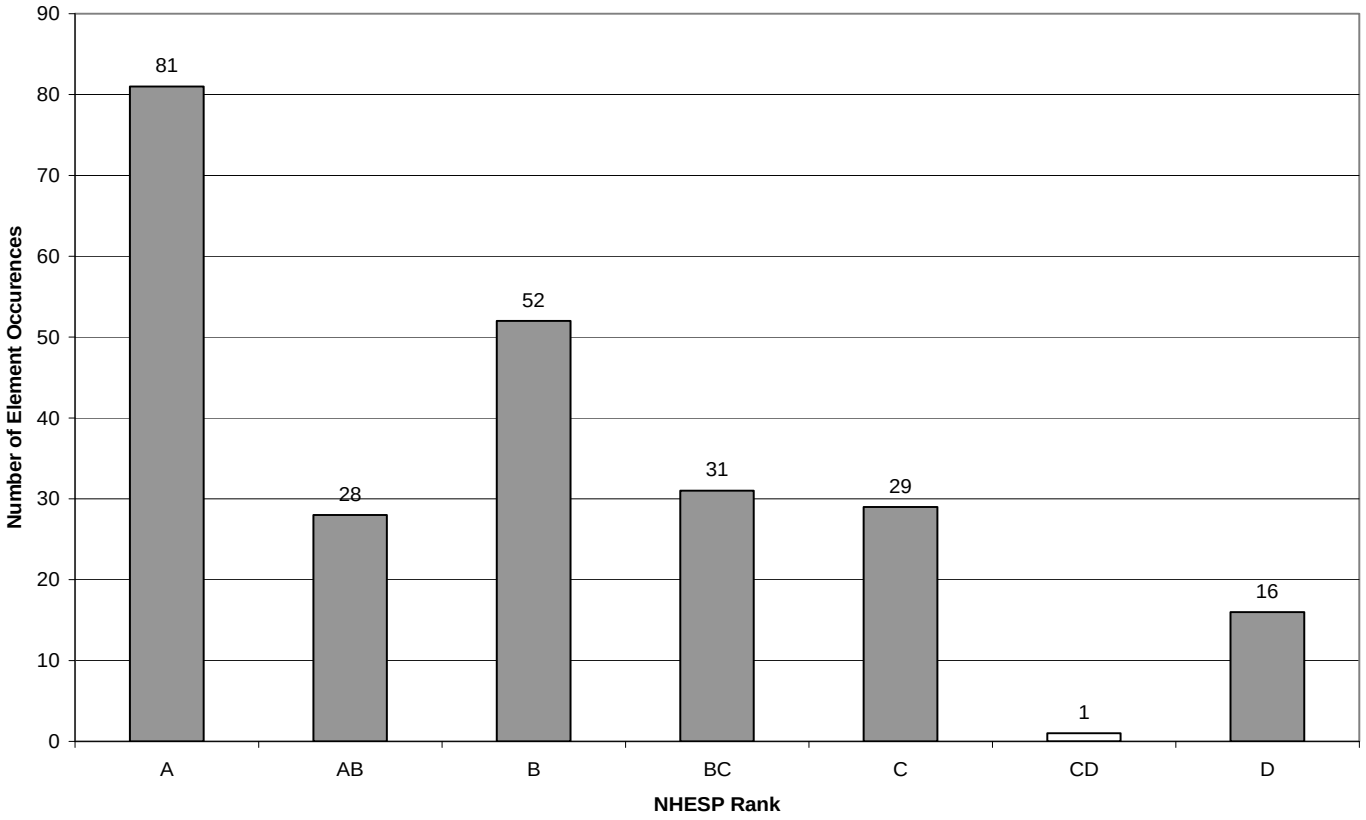
Appendix A

Figure 3. Cumulative number of *Hemidactylium scutatum* Element Occurences by year of observation. Historic occurrences not redocumented within 25 years are not included.



Appendix A

Figure 4. NHESP's ranking for *Hemidactylium scutatum*'s current Element Occurrences. Ranking of the quality and likely viability of each element occurrence is based upon the number of individuals observed, direct evidence of breeding, and a qualitative assessment of the extent of available forest habitat and extent of habitat fragmentation at the +/-0.5-1.0 km scale surrounding the occurrence.



Appendix A

Figure 5. Protected land (Openspace) Blocks in Massachusetts with *Hemidactylium scutatum* documented.